
Roles of Allelopathy in Subtropical Ecosystems, Case Studies in Taiwan

Chang-Hung Chou^{*†1}

¹Research Center for Biodiversity – China Medical University 91, Hsueh-Shih Road, Taichung, 404, Taiwan

Abstract

Allelochemicals released from plants play very important roles in sustainable ecosystem, such as dominance, succession and climax of plant community, biodiversity and crop productivity. Since 1972 the author and his colleagues have conducted numerous studies in elucidating the mechanism of aforementioned subjects. For examples, that mechanism of formation of pure stand of *Rhododendron formosanum*, *Astonia scholaria*, *Acacia confusa*, *Miscanthus floridulus* and *M. transmorrisonesis*, etc. was due to the allelopathic interaction. The responsible compounds are phenolics, flavonoids, terpenoids, and alkaloids. In addition, we also investigated the cause of yield reduction of the second crop of rice plant in Taiwan, indicating that the allelochemicals released during the decomposition of rice residues in soil were through microbial interaction. The phenomenon was designated as autointoxication, in which six phytotoxic phenolics and short chain fatty acids were involved. The autotoxic phenomenon attracted many allelopathic scientists in many countries. Recently, the autointoxication mechanism of *Oryza sativa* was elucidated by an approach of molecular genomics, which turns out to be very interesting for future research. Furthermore, we even found that an allelochemical, (-)-epicatechin, released from the *Rhododendron* was biotransformed into a more phytotoxic active compound, protocatechuic acid, by soil microorganism and finally converted into glycerol as carbon source for soil microorganisms. This unique case will bring more scientists attention to further investigation on the role of microbial enrollment in allelopathic interactions. Our group also conducted experiments in laboratory, greenhouse, and field by applying the allelopathic compounds as naturally occurring herbicides to improve productivity and weed control in agricultural practice, which exhibits to be important for sustainable agriculture and will be beneficial to human wellbeing.

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^{*}Speaker

[†]Corresponding author: choumasa@mail.cmu.edu.tw